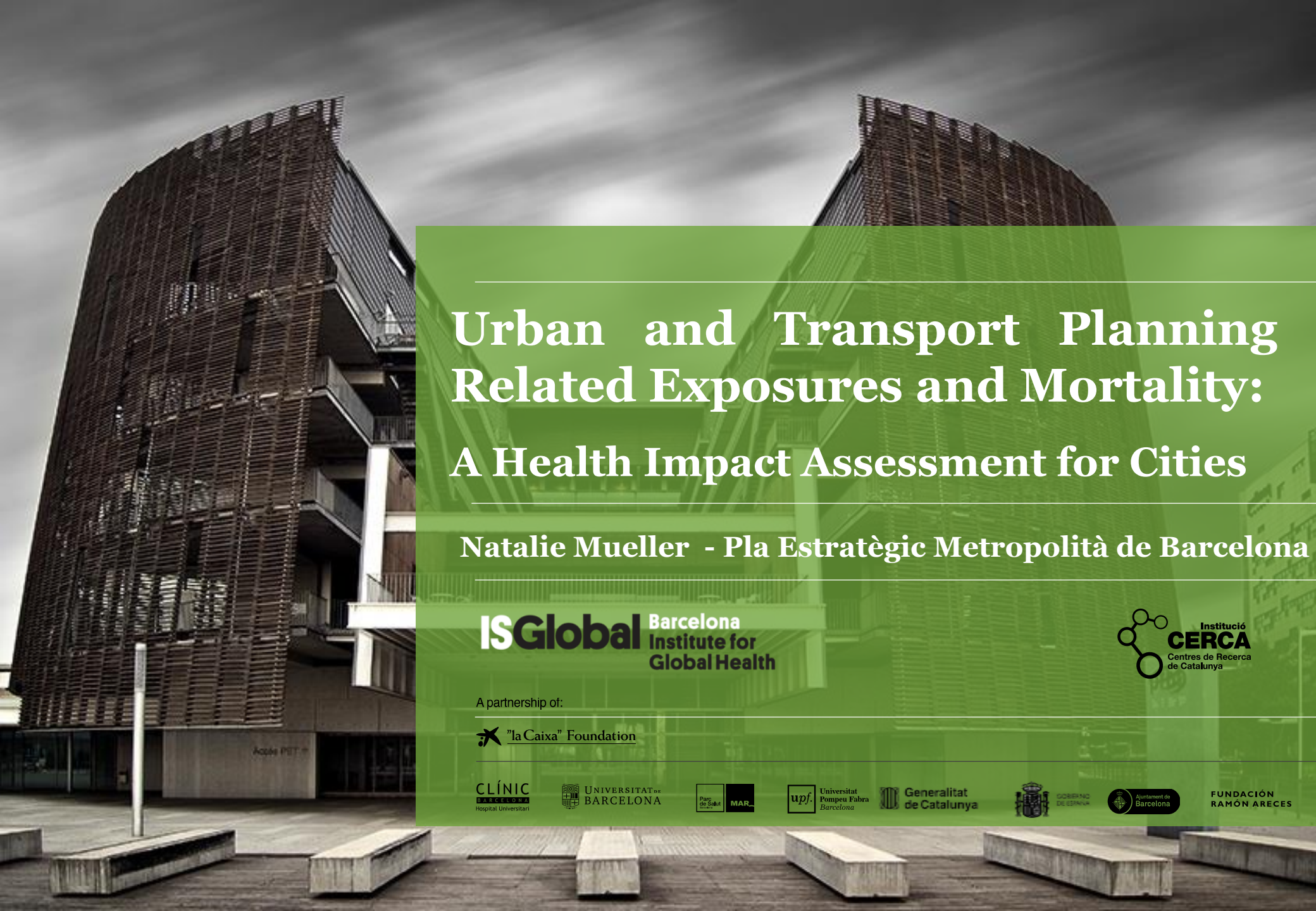

Urban and Transport Planning Related Exposures and Mortality:

A Health Impact Assessment for Cities

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ISGlobal Barcelona Institute for Global Health

Institució CERCA Centres de Recerca de Catalunya

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Urban and Transport Planning Related Exposures and Mortality: A Health Impact Assessment for Cities

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Background: By 2050, nearly 70% of the global population is projected to live in urban areas. Because the environments we inhabit affect our health, urban and transport designs that promote healthy living are needed.

Objective: We estimated the number of premature deaths preventable under compliance with international exposure recommendations for physical activity (PA), air pollution, noise, heat, and access to green spaces.

Methods: We developed and applied the Urban and TranspOrt Planning Health Impact Assessment (UTOPHIA) tool to Barcelona, Spain. Exposure estimates and mortality data were available for 1,357,361 residents. We compared recommended with current exposure levels. We quantified the associations between exposures and mortality and calculated population attributable fractions to estimate the number of premature deaths preventable. We also modeled life-expectancy and economic impacts.

Results: We estimated that annually, nearly 20% of mortality could be prevented if international recommendations for performance of PA; exposure to air pollution, noise, and heat; and access to green space were followed. Estimations showed that the greatest portion of preventable deaths was attributable to increases in PA, followed by reductions of exposure to air pollution, traffic noise, and heat. Access to green spaces had smaller effects on mortality. Compliance was estimated to increase the average life expectancy by 360 (95% CI: 219, 493) days and result in economic savings of 9.3 (95% CI: 4.9, 13.2) billion EUR/year.

Conclusions: PA factors and environmental exposures can be modified by changes in urban and transport planning. We emphasize the need for *a*) the reduction of motorized traffic through the promotion of active and public transport and *b*) the provision of green infrastructure, both of which are suggested to provide opportunities for PA and for mitigation of air pollution, noise, and heat.

For this purpose, we developed the Urban and TranspOrt Planning Health Impact Assessment (UTOPHIA) model and conducted a health impact assessment (HIA) for Barcelona, Spain. We estimated the impact of meeting the international recommendations for performance of PA; exposure to air pollution, noise and heat; and access to green spaces on preventable natural all-cause mortality, life expectancy, and economic savings.

Methods

Study Setting

As of 2012, Barcelona, which is located on the northeastern coast of Spain, had 1,620,943 inhabitants living in an area of 101 km^2 (Barcelona City Council 2012). Barcelona has a Mediterranean climate with an annual mean temperature of 18°C through mild winters and hot, humid summers (Barcelona City Council 2012). Temperatures in the densely inhabited center of Barcelona can

Urbanization

- By 2050 almost 70% of the world's population will live in urban environments.



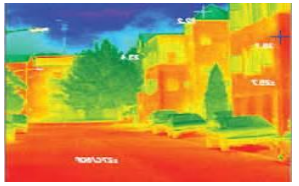
Opportunities

- Innovation and progress
- Access to goods and services
- Social interaction

Challenges

- Sedentary lifestyle
- Air pollution
- Noise
- Urban heat islands
- Lack of green and open spaces




Mortality & Morbidity

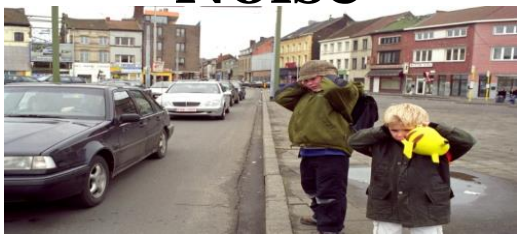
Exposures in cities

Physical inactivity

- Leading risk factors in GBD Study
- Cause ≥5 million deaths globally

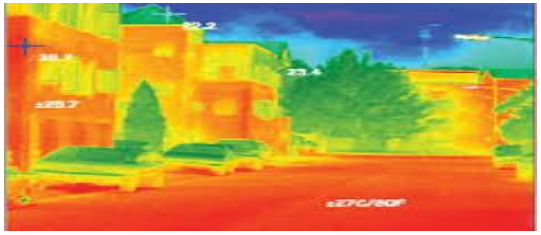
Air pollution

Noise



- Motorized traffic exposes 40% of Europeans to ≥55 dB(A)

Heat



- Emissions cause anthropogenic heat that together with re-radiation of construction contribute to urban heat islands

Green space

- Few green spaces despite benefits for physical and mental health

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Health impact assessment

We aimed at estimating

- **Preventable all-cause mortality**

under compliance with international exposure recommendations for

(1) physical activity
(2) air pollution
(3) noise
(4) heat
(5) access to green spaces

} Urban & transport planning related exposures

…. in Barcelona

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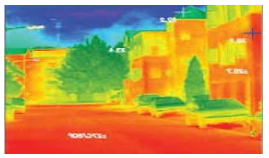
Exposure recommendations

Physical activity (WHO)	150 minutes of moderate-intensity aerobic physical activity or 75 minutes of vigorous intensity aerobic physical activity weekly
Air pollution (WHO)	Annual mean $PM_{2.5}$ = 10 µg/m^3
Noise (WHO)	Day time (7:00-23:00 hr) outdoor activity noise levels ≤55 dB(A)
Heat (literature)	Modifying urban plan may provide cooling of up to 4 ºC
Green space (EC, WHO)	Access to green space ≥0.5 ha within 300 m linear distance

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Study setting Barcelona

Population	N=1.6 million (≥20 years N=1.3 million)
Area	101 km² (high population density)
Climate	18 ºC mean temperature, hot summers, mild winters, low precipitation
Vehicle fleet	500,000 cars and 300,000 motorcycles + large daily suburban commuter fleet
Urban design	Narrow street canyons Dense construction of semi-tall buildings (5-6 stories)
Green spaces	7 m² per resident

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Carrer d'Aribau
Carrer de Còrsega
Carrer del Rosselló
Carrer d'Enric Granados
Carrer de Còrsega
Carrer del Rosselló
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Carrer de Provença
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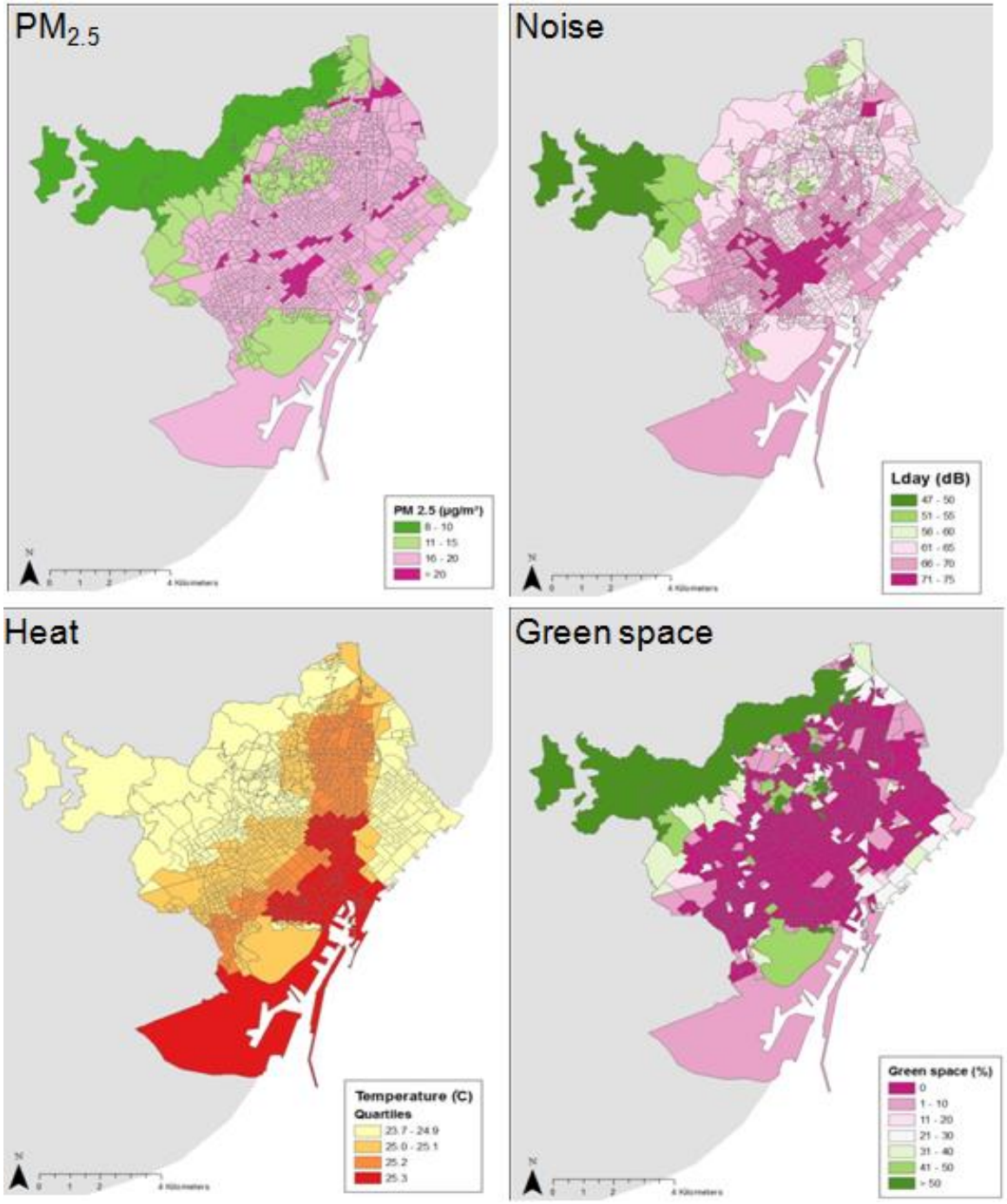

Current environmental exposure maps

Physical activity:
70% of population insufficiently active

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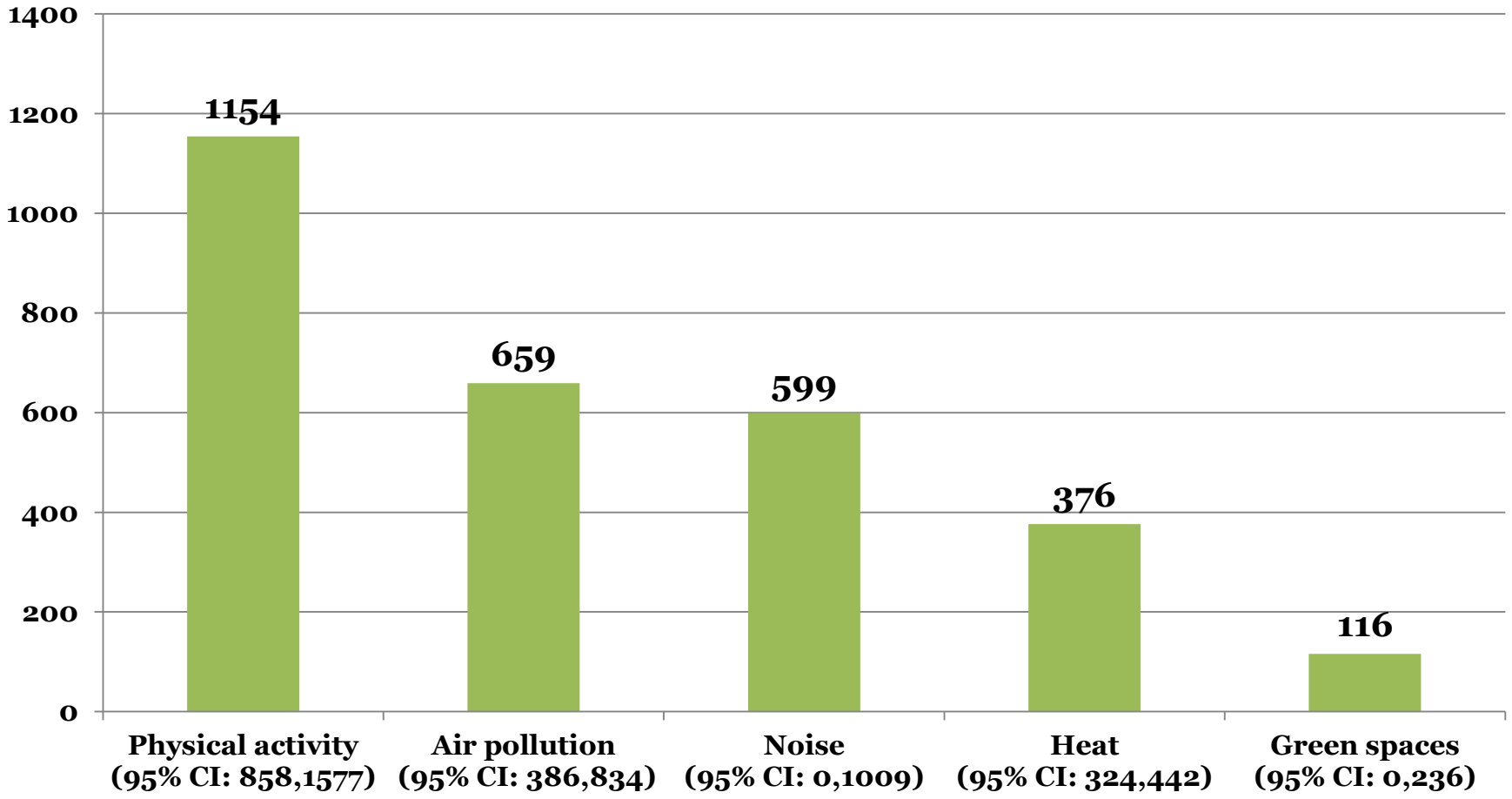
Mortality

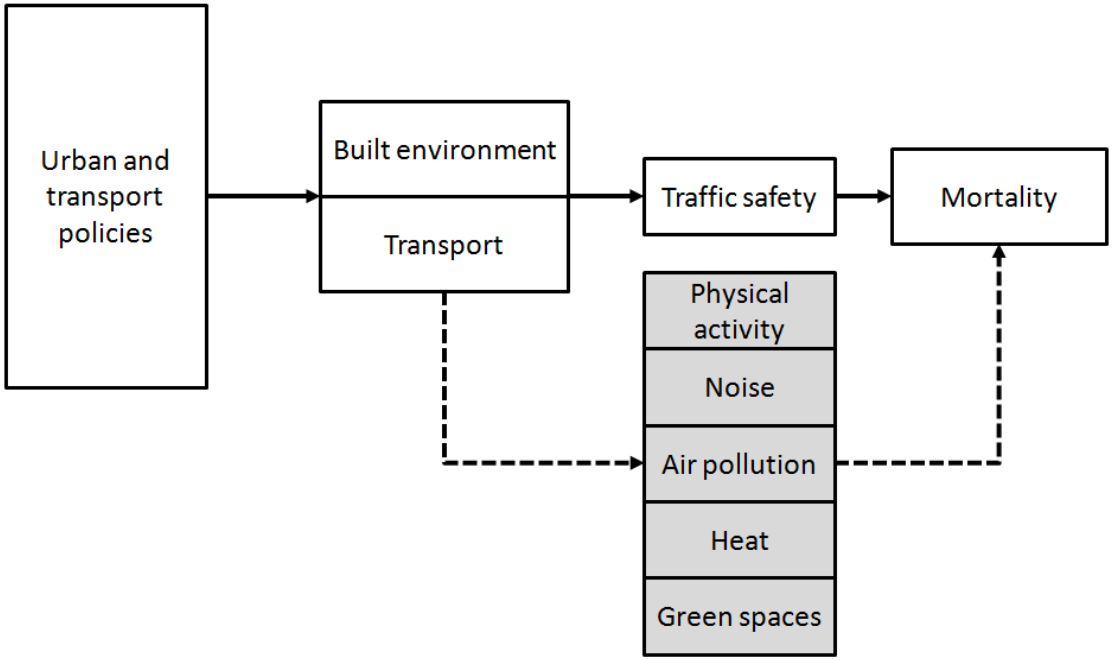
Mueller et al. 2017



- N= 2904 (Almost 20% of mortality)

Solutions

- Solutions can be found in changes to urban and transport planning
- Number of estimated preventable deaths (**N= 2904**) is much larger than annual number of traffic fatalities in Barcelona (**N=30**, 2012)
- Need for multidisciplinary approach to urban environmental quality and associated health benefits



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Solutions

Active and public transport

Green spaces

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Thank you!

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